Investigation and Remediation of Diesel Fuel Leak at the Longview Fibre Company Seattle Plant Seattle, Washington

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1. BACKGROUND INFORMATION

Three underground storage tanks (USTs) were removed at the Longview Fibre (LFC) Seattle plant in August 1987 (CH2M HILL, 1987). One of the three USTs was determined to have leaked. Three monitoring wells were installed near the removed tanks in October 1987 to assess potential groundwater quality impacts (CH2M HILL, 1988). The locations of the removed USTs and the three monitoring wells are shown in Figure 1.

Following recovery of residual floating hydrocarbons in the vicinity of monitoring well MW-3 on the west side of the plant building in 1988 and 1989, regular measurement and sampling of the three monitoring wells was initiated in March 1990. The goal of this post-UST removal monitoring program was to confirm the decline of total petroleum hydrocarbons in groundwater to concentrations below Ecology cleanup levels (CH2M HILL, 1990).

A 5,000-gallon above-ground storage tank (AST) was installed in 1990 to store No. 2 diesel as standby fuel for the plant boiler, which was served by interruptable natural gas. This new tank replaced the UST that was formerly located near the east side of the plant building (Figure 1).

2. DISCOVERY OF DIESEL RELEASE

During the routine monitoring of the three onsite monitoring wells on January 4, 1991, LFC staff observed that the water-level probe used in MW-1 was covered with petroleum product. This monitoring well had always shown clean water prior to this date. An overflow during filling of the AST was initially suspected as the source of the release. The AST had been filled after installation and was used for first time in December 1990, when gas service to the plant was interrupted and the boiler was switched to fuel oil. Four fuel deliveries were made in December 1990, and visual evidence of spillage on the outside of the tank and surrounding snow-covered ground was present.

Product recovery from monitoring well MW-1 was initiated immediately by LFC staff on January 4, 1991 using pumping equipment on hand from prior fuel recovery efforts at MW-3. Recovered product was stored in 55-gallon drums. LFC notified Ecology of the release on January 7, 1991 and updated Ecology on January 11th regarding the product recovery efforts and source investigation.

3. FIELD INVESTIGATION

Test pit excavations were initiated on January 21, 1991 to assess the source and extent of product. Representatives of LFC and CH2M HILL were present when the excavations were made. Visible product saturation and seepage from test pit walls was observed at depths of 9 to 10 feet below grade (on top of the water table), along with a strong diesel fuel odor. Upon completion, product rapidly accumulated on top of the water table at the bottoms of the test pits. The quantity and depth distribution of the product observed in these test pits

indicated a source other than surface spillage was likely. Laboratory testing of the product confirmed it to be diesel fuel.

Given the extent of product observed in the initial test pits, the decision was made to continue tracking the product with additional test pits. Product recovery was initiated by LFC by means of a temporary perforated plywood box set in one of the test pits. LFC subsequently perforated 10-foot lengths of 36-inch diameter corrugated steel culverts with drilled holes, and the backhoe contractor installed these open-ended pipes in test pits to enhance product recovery.

The backhoe work was completed on February 7, 1991, with a total of nine test pits excavated and equipped with perforated culverts (designated as S-1 through S-9 in Figure 2). Residual soils from the test pit excavations were stockpiled and hauled to an asphalt plant for disposal by the contractor.

4. INVESTIGATION OF PRODUCT RELEASE MECHANISM

With the preliminary results of the field investigation indicating a likely product release source other than a surface spill, LFC initiated an assessment of the AST and associated fuel lines in the vicinity of the boiler. In the process of inspecting the boiler connections, a fuel bypass recirculating system was discovered consisting of a pump, a pressure-relief valve, and a discharge line that was formerly connected to the UST that was removed in 1988. The bypass piping system connection to the boiler was still active, allowing flow of fuel from the boiler into the bypass pipe.

Pressure testing of the bypass line indicated that the end formerly connected to the removed UST was not capped. As a result, when the boiler was operated using diesel fuel beginning in December 1990, diesel was pumped out the bypass line into the ground. This mechanism was determined to be the source of the diesel release.

LFC conducted boiler tests in February 1991 to measure the flow rate range of the recirculation pump and to estimate the volume of diesel pumped into ground. The amount of diesel released was estimated on the basis of the following information (Longview Fibre Company, 1991):

Duration of boiler operation

150 hours, between December 18 and 28, 1990

Range of recirculating line flow rates

0.66 gallons per minute @ 23 psi backpressure to 0.87 gallons per minute @ 0 psi backpressure

Estimated range of diesel released through recirculating line

150 hr x 60 min/hr x 0.66 gal/min = 5,940 gallons
150 hr x 60 min/hr x 0.87 gal/min = 7,830 gallons

The five pipes that formerly connected the boiler to the boiler-fuel (the recirculation pipe, two product delivery pipes, and two steam-trace pipes) were subsequently disconnected from the boiler and capped outside the building wall by LFC.

5. PRODUCT RECOVERY

As noted in Section 2 of this report, LFC started recovering product from monitoring well MW-1 on the day the product release was discovered (January 4, 1991). As the culvert product recovery sumps were installed in the nine test pits, LFC began measuring groundwater levels and product thickness, pumping diesel from each sump, and recording the cumulative amount of product recovered. Data sheets compiled by LFC for the nine test-pit culvert sumps are included in Appendix A.

Product recovery from the sumps was conducted by LFC from February 1991 through June 1992. LFC fabricated a system of suction pipes in individual sumps connected to a header and suction pump. The majority of diesel was observed in sump S-3 and S-4, closest to the uncapped recirculation pipe, and the least amount of diesel was present in sumps 1 and 6 (see Figure 2).

Recovered product was initially collected in 55-gallon drums. Above-ground holding tanks were subsequently used to allow storage of greater product volumes and more efficient separation of oil and water. Recovered diesel was taken offsite by an oil service company retained by LFC. Water drained from the bottom of the storage tank was discharged to the sanitary sewer system with approval from Ecology.

Aggregate quantities of diesel recovered from all of the sumps were recorded by LFC and are summarized in Table 1. LFC records (Longview Fibre Company, 1993) indicate that a total of 4,200 gallons of recovered diesel were transported from the area of the release through June 1992.

6. CONTAMINATED SOIL REMEDIATION

By June 1992 quantities of diesel in the sumps had diminished to intermittent thin product layers and sheens. Also at this time, LFC needed to restore the diesel release area of the plant site for use as a truck staging and unloading area. Plans were developed for removal of the sumps, excavation and offsite disposal of diesel-contaminated soils, placement of compacted backfill, and installation of new pavement.

The excavation plan required consideration of the following physical constraints: a 10-foot offset from the center of the railroad tracks bounding the release site on the east and south (required by the Union Pacific Railroad); the wall of the LFC plant building on the west; the foundation of the large starch silo on the northwest; and the edge of pavement of Fidalgo Street on the north (see Figure 2).

The remediation plan was implemented between October 13 and 15, 1992, and consisted of the following:

- Draining and temporary removal of the 5,000-gallon diesel AST
- Demolition and removal of the concrete base/containment of the AST
- Removal and disposal of the product recovery culverts from the test pits and of monitoring well MW-1, to allow access for diesel-contaminated soil removal
- Excavation of surficial (uncontaminated) and underlying diesel-contaminated soils to the water table (approximately 10 feet below grade) within the area bounded by the physical constraints (Union Pacific Railroad tracks, LFC plant building wall, LFC starch silo foundation, and edge of Fidalgo street pavement) (see Figure 2)
- Segregation of excavated soils into clean and contaminated piles on the basis of field PID and visual observations
- Covered storage of contaminated soils
- Characterization of stockpiled soils for offsite disposal (contaminated soils) or for use as backfill (clean soils)
- Placement and compaction of onsite and imported backfill in the excavation
- Restoration of the above-ground storage tank, tank base, and surrounding pavement
- Transport and disposal of diesel-contaminated soils

Church Construction of Seattle conducted the excavation, stockpiling, backfill, and above-ground tank work. Rolloff containers, transportation, and disposal of diesel-contaminated soils at the Roosevelt Regional Landfill were provided by Regional Disposal Company, Seattle. A total of 1,000 tons of diesel-contaminated soil were disposed, as documented by the certification included in Appendix B.

Soil samples from the contaminated and clean stockpiles were collected for WTPH-diesel laboratory analysis. The two samples from the contaminated stockpile had concentrations of 9,800 and 9,200 mg/kg diesel dry weight (moisture contents of 81.1% and 78.7%, respectively). The sample from the clean stockpile had a concentration of 8.9 mg/kg diesel (moisture content of 85.4%). The laboratory reports are included in Appendix C.

7. COMPARISON OF PRODUCT RELEASED TO PRODUCT RECOVERED

The volumes of diesel recovered (free product and contaminated soil) versus diesel released were estimated as follows:

Estimate of free product recovered

4,420 gal (see Section 5 of this report)

Estimate of product recovered in soil

average TPH-Diesel concentration in soil = 9,500 mg/kg (see Section 6 of this report)

1,000 tons wet x 80% solids x 9,500 ppm dry x 2,000 lb/ton = 15,200 lb TPH-D

15,200 lb TPH-D / (8.33 lb/gal x 0.85 SG) = 2,147 gallons

Estimate of total product recovered, free product + soil

4,420 gallons + 2,147 gallons = 6,567 gallons

Estimate of product released

5,940 to 7,830 gallons (see Section 4 of this report)

8. STATUS OF POST-UST REMOVAL GROUNDWATER MONITORING PROGRAM

As discussed in Section 1 of this report, regular monitoring of the three onsite monitoring wells was initiated in March 1990 to complete the post-UST removal investigation, with the goal of confirming the absence of or the decline of total petroleum hydrocarbons in groundwater to concentrations below Ecology cleanup levels. Table 2 presents a summary of product observations performed by LFC staff between March 1990 and June 1992.

The data in Table 2 show no visual detections of product in well MW-2 for the period of record. Well MW-3, where product recovery had previously been implemented, showed observable or measurable product through August 1991, followed by three consecutive events of no visual product detections through June 1992. Data for well MW-1 show no visual product detections prior to the diesel release in December 1990, and measurable product thicknesses that declined through June 1992 as the diesel recovery operation was implemented by LFC.